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(54) Envelope for preparing a multi-sheet mail piece.

(57) An envelope form suitable for folding about one or more sheets having predetermined lengths and widths. The form includes a lower panel (20) which forms the back panel of the resulting envelope, and the length of which is approximately equal to one-third of the predetermined sheet length, and the width of which is substantially less than the predetermined sheet width. The width of the lower panel (20) is substantially less than the width of the sheets so that automatic centering guides may be employed to center the sheets with respect to the forms. An upper panel (12) is attached to the lower panel (20) along a first transverse fold line (24). The length of the upper panel (12) being substantially greater than the length of lower panel (20) and the width of the upper panel (12) being at least slightly greater than the width of the sheet. Side flaps (16) are provided to close the edges of the resulting envelope and an upper, or trailing flap (14) is provided to close the mouth of the envelope. An apparatus suitable for printing envelope forms and sheets, assembling these sheets with the envelope form and folding and sealing the resulting accumulation to form a mail piece is also disclosed.

EP 0 450 774 A1

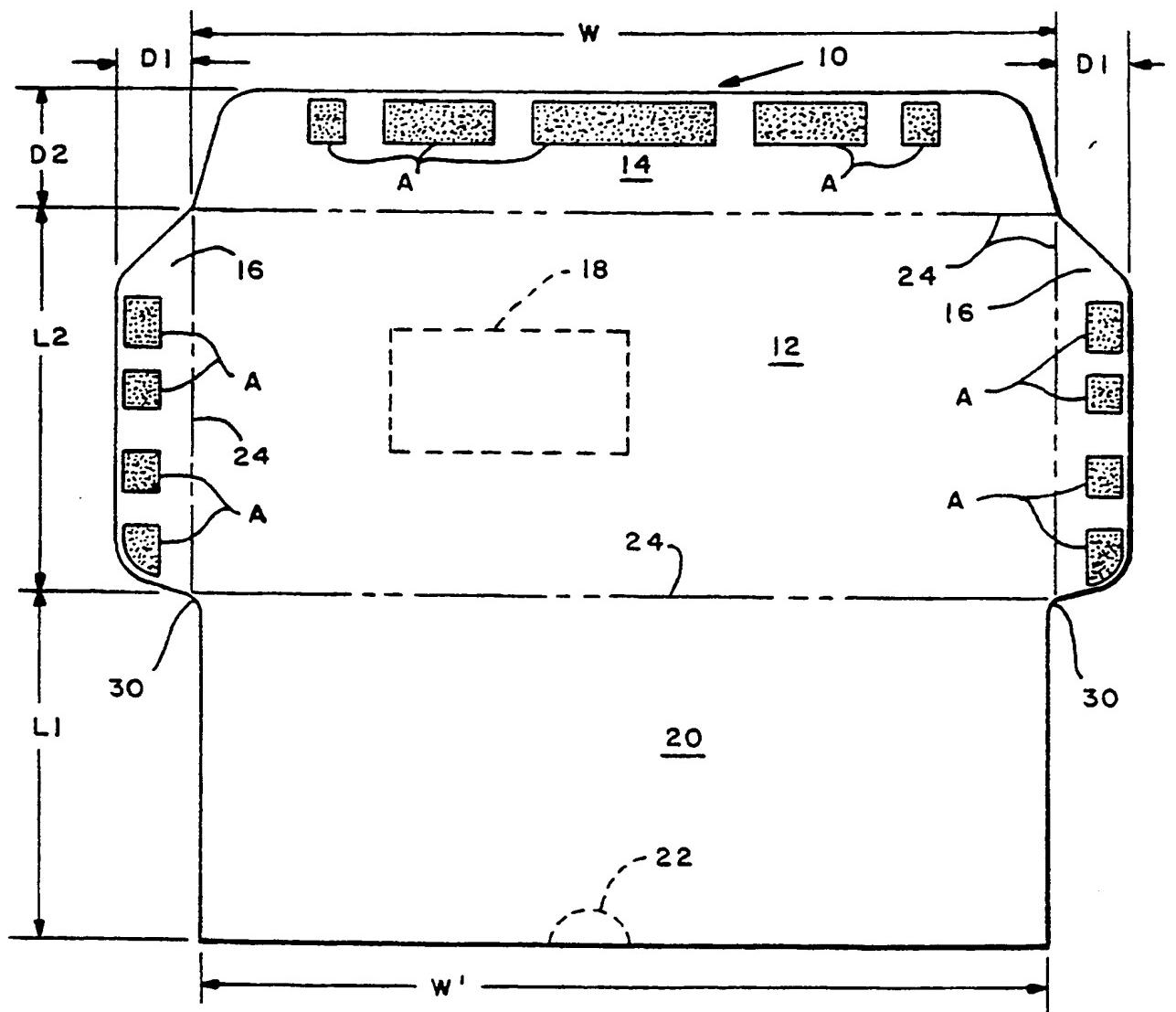


FIG .2

ENVELOPE FOR PREPARING A MULTI-SHEET MAIL PIECE

This invention relates to the production mail pieces. More particularly, it relates to an envelope form which may be combined with a plurality of printed or pre-printed sheets to produce mail pieces in a selected one of a plurality of possible configurations.

5 Self-mailers are mail pieces which are produced from pre-cut forms which are folded and sealed to form a mail piece, and are well known, as is apparatus for printing and forming such self-mailers. Commonly assigned, co-pending U.S. Application, serial no. 407,583, to: Samuel W. Martin, filed September 14, 1989 (C-574) proposes one such self-mailer wherein a pre-cut form is printed on a laser printer, or similar computer output printer, and fed to a folding and sealing apparatus to produce a self-mailer. Similarly, U.S. Pat. No. 3,995,808
10 to: Kehoe, issued September 7, 1976 discloses another self-mailer wherein a web of forms is printed, folded longitudinally and sealed, and separated to form individual self-mailers. U.S. Pat. No. 4,063,398 to: Huffman, issued: December 20, 1977 discloses another self-mailer wherein a web of forms is folded transversely to produce self-mailers. Huffman also provides for insertion of preprinted piece or "stuffers".

15 In general self-mailers as taught by the prior art are useful as a means of generating large numbers of mail pieces, but are limited in that they can be formed into only a small number of configurations. (By configurations, as applied to mail pieces herein, is meant variations such as use of a windowed or a printed envelope, variations in the number and type of printed pages, and variations in the number and type of pre-printed inserts.) At most, like Huffman they may provide for an ability to insert "stuffers". Further, with the exception of the above mentioned U.S. Application, Serial No. 407,583 (C-574), the equipment for producing such self-mailers has generally been physically large and suitable only for use in environments such as large computing centers.

20 Where it has been necessary to provide greater flexibility in the configuration of a mail piece which may be produced the solutions taught by the prior art have generally involved the use of inserters. An inserter is a transport system having a plurality of stations and along which a "control document" is transported from station to station. At selected stations pre-printed inserts may be accumulated with the control document and at the 25 last station the entire accumulation is inserted in a pre-formed envelope. A typical use of such inserter systems would be by a bank mailing monthly statements to its customers, where the control document would be individual statements printed on the bank mainframe computer and the inserts would include each individual's cancelled checks. Such inserter systems are described, for example, in U.S. Patent No. 3,935,429; for: Process and Apparatus for Controlling Document Feeding Machines From Indicia on a Document Fed Therefrom; to:
30 Braneky et al; issued: January 27, 1976.

35 Inserters do provide a high degree of flexibility in producing mail pieces in a number of configurations, and have proven very satisfactory for users such as banks and credit card companies. However, they suffer also from major limitations. First, because inserter systems generally do not operate under the control of the computer which prints the control document, a very significant problem exists in assuring that the proper inserts are matched with the correct control document. Because of this difficulty it has generally been necessary to use window envelopes with inserter systems rather than printed envelopes, so that the address printed on the control document is used to deliver the mail piece. Finally, inserters, like equipment for producing self-mailers, are generally quite physically large and suitable for use only in a large computer operation or production mail room.

40 Another approach to the problem of producing mail pieces was developed by the present Applicant under contract with the U.S. Postal System. This equipment, known as PPHE (Printing and Paper Handling Equipment), printed a continuous web, collated and separated the web to form sheets, folded the collated sheets longitudinally, and wrapped an envelope form around the wrapped sheets. The PPHE had a capability to add "stuffers" to a mail piece and was intended for production applications only, as the equipment was tens of feet long (well over 3 metres long, perhaps 5 to 10 metres). The PPHE lacked capability to print envelope forms or handle variable length sheets.

45 It would be desirable if there was available an envelope form which may be combined with one or more printed or pre-printed sheets to produce a mail piece in a selected one of a plurality of possible configurations.

50 There is disclosed herein an envelope form for forming an envelope to enclose at least one sheet having a length equal to one-third, two-thirds, or three-thirds of a predetermined length, such as the standard length of a commercially available stationery sheet. The width of the sheet is similarly pre-determined. The envelope form includes a substantially rectangular lower panel for forming the back panel of the resulting envelope, the length of the lower panel being approximately one-third of the predetermined length and the width of the lower panel being less than or equal to the predetermined width. The envelope form also includes a substantially rectangular upper panel for forming the address panel of the envelope, and which is joined to the lower panel along a transverse fold line. The length of the upper panel is substantially greater than the length of the lower panel

and the width of the upper panel is at least slightly greater than the predetermined width of the sheet. A pair of side flaps for closing the edges of the resulting envelope are connected to the upper panel along first and second longitudinal fold lines, and an upper flap for closing the mouth of the resulting envelope is connected to the upper panel along a second transverse fold line. The width of the lower panel, which is less than or equal to the width of the sheet, is chosen to allow automatic centering guides to center said sheet with respect to said form, and the width of the upper panel is chosen so that the longitudinal fold lines lie outwards of the sheet so that the side flaps may be readily folded about the fold lines to enclose the edges of the resulting envelope.

In accordance with one aspect of the invention the envelope form includes filets at the corners where the lower panel joins the upper panel to insure that the lower corners of the resulting envelope are completely enclosed.

Thus, it may be seen that the envelope form disclosed herein advantageously overcomes the disadvantages of the prior art in that it provides an envelope form which may be wrapped about one or more sheets to form a mail piece, and which is specifically shaped to readily allow automatic centering for the sheets with the form.

Also, such a form can be addressed by a personal computer output.

The invention and its advantages will be better apparent to those skilled in the art from consideration of the attached drawings and the detailed description of a preferred embodiment set forth below. In the drawings:-

Figure 1 shows a schematic block diagram of system for preparing mail pieces which include an envelope form according to the invention.

Figure 2 shows a plan view of an envelope form according to the invention.

Figure 3 shows a schematic cross section of a printer and of a folder sealer apparatus used in the system of Figure 1 to form mail pieces including the envelope form of Figures 1 and 2.

Fig. 1 shows a system for producing mail pieces and with which an envelope form according to the invention may be used. The system includes a personal computer 1 including a monitor 2, a hard disk 3 with a minimum of one megabyte of available storage, and a keyboard 4. Computer 1 also requires a minimum of 640K of RAM memory in the subject invention. Optionally a computer "mouse" (not shown) may be provided for operator input. Computer 1 communicates with laser printer 5 through a conventional parallel interface which is preferably the well known Centronics interface. Preferably, Laser printer 5 is a commercially available Laser printer such as those marketed by the Hewlett Packard Corporation under the trademark "Laser Jet". Other printers, including ink jet and impact printers, may also be used in the subject invention.

Laser printer 5 includes trays T1 and T2 from which sheets are fed to laser printer 5 for printing, as will be described further below. Tray T1 may be used for envelope forms, and tray T2 may be used for either three-thirds sheets or two-thirds sheets.

Laser printer 5 is mounted on, and physically connected to, folder sealer 6 so that, after printing, sheets are passed from laser printer 5 to folder sealer 6 where they are accumulated with an envelope form, folded and sealed, and output to stacker 7. Folder sealer 6 also includes trays T3 and T4 which may be used to add pre-printed sheets to the mail piece. Tray T3 and tray T4 may be used to supply either three-thirds, two-thirds, or one-thirds length pre-printed sheets or pre-printed business reply envelopes (BRE's) to be added to the mail pieces. Tray T3 may also be used to provide a window envelope form so that the address of the mail piece may be printed on a printed sheet rather than a separate (non-window) envelope form.

Fig. 2 shows a preferred example of envelope form, in accordance with the invention, which is designed to function optimally with the apparatus of Figure 1. Form 10 includes a substantially rectangular upper panel (hereinafter sometimes "portion") 12 having an upper (or trailing) flap 14 and a pair of side flaps 16. Panel 12 may also be provided with a window 18 so that the mail piece formed when form 10 is folded and sealed may be delivered to an address printed on a sheet in the mail piece. An adhesive A is applied to flaps 14 and 16 to provide for sealing of form 10 to form an envelope. Preferably adhesive A is applied to flaps 14 and 16 as spaced stripes or spots so that form 10 may be driven through the apparatus of Figure 1 by segmented rollers contacting form 10 in the spaces between the stripes or spots of adhesive A to prevent contamination of the rollers when adhesive A is moistened prior to sealing and, also, to reduce curling of the form. Adhesive A is preferably a remoistenable adhesive which is moistened for sealing as will be described further below, but the use of self-adhesive or other suitable methods of sealing is within the contemplation of the subject invention. A satisfactory adhesive is a dextrin/resin based, water activated adhesive. Approximately from 0.0006 to 0.001 inches of glue thickness yields a satisfactory bond (to convert inches to millimetres, multiply by 25.4). Flaps 14 and 16 are attached to upper portion 12, as is a rectangular lower portion 20, along preformed fold lines 24.

To form a mail piece sheets, which may be three-thirds, two-thirds, or one-thirds sheets or BRE's, are accumulated with form 10, and form 10, together with the accumulated sheets, is folded about a preformed fold line 24 so that the accumulated sheets are enclosed between panels 12 and 20. Adhesive A is moistened, and after folding of panels 12 and 20 and the accumulated sheets, flaps 16 are folded inwards about a preformed

fold lines 24 and flap 14 is then folded downwards about preformed fold lines 24, and the resulting mail piece is sealed.

Note that three-thirds length sheets are prefolded to two-thirds length so that the resulting mail piece is approximately one-third the length of a three-thirds sheet.

5 Form 10 also may be provided with expansion fold lines positioned outwards of and parallel to lines 24 to allow for mail pieces having a maximum thickness and lower panel 20 may be provided with a notch 22 to facilitate removal of the sheets when the mail piece is opened.

10 Form 10 is designed for optimal performance with the apparatus of Figure 1. The width W of upper panel 12 is chosen to be slightly greater than the width of the sheets to be used in the mail piece so that fold lines 24 are positioned outwards of the sheets so that flaps 14 and 16 may be readily folded around lines 24, and the length L1 of lower panel 20 is chosen to be approximately equal to one-third the length of a full size sheet to be used with the mail piece. The length L2 of panel 12 is chosen to be substantially greater than length L1 to allow for increase tolerance in positioning these sheets on form 10. The width W' of lower panel 20 is less than or equal to the width of the sheets to be used in the mail piece. By providing width W' less than or equal to the width of the sheets automatic centering guides may be used to center the sheets with respect to form 15 10 before it is folded as will be described further below. Further, a narrower lower panel 20 allows greater skew tolerance in folding the lower panel, and aids in enveloping the contents of thicker mail pieces by permitting side flaps 16 to wrap more gradually about the mail piece.

20 Because lower panel 20 is substantially shorter than upper panel 12 the width D1 of side flaps 16 and length D2 of upper flap 14 are chosen to be sufficient to assure that the sealed mail piece completely encloses these sheets. Upper flap 14 is also formed to be substantially rectangular to assure that the envelope is closed across its full width, and lower panel 20 is provided with bevels (or filets) 30 so that it flares to the full width of upper panel 12 to assure that the lower corners of the completed mail piece are closed. It should also be noted that adhesive A on side flap 16 is applied so that it extends no further than lower panel 20 when the envelope is folded and does not come into contact with the sheets within the mail piece.

25 For a standard 8 1/2 x 11 size three-thirds sheet the following approximate dimensions have been found to be satisfactory for form 10.

30 D1 = 0.75 inches
 D2 = 1.31 inches
 L1 = 3.75 inches
 L2 = 4.13 inches
 W = 8.70 inches
 W' = 8.50 inches

35 Turning now to Fig. 3 a semi-schematic side view of folder sealer 6 is shown. The accumulation of printed or pre-printed sheets with form 10 and folding and sealing of form 10 to form a mail piece will be described with respect to Fig. 3. As a printed envelope form 10 or a printed sheet exit laser printer 5 it is driven along guides 100 by roller pair 102 and then urged into the nip of accumulator folder assembly 106 by urge roller 104. (As used herein a sheet is "urged" when it is moved by an "urge roller" constructed to slip (or stall) on the sheet before the sheet will buckle under the load. This contracts with which are driven by a roller pair in a positive manner, substantially without slipping.) Normally the first item will be an envelope form 10 and gate G2 will be 40 in the activated (closed) state diverting form 10 for further processing as will be described further below. Normally following items will be printed sheets and motor M1 (not shown), which drives folder accumulator assembly 106, will be stopped and the sheets will be urged into the nip of assembly 106 by urge roller 104, which will continue to rotate. Because guide 100 is curved to increase the stiffness of the sheets and roller 104 will slip 45 on the sheets as they are urged into the nip of assembly 106 before the sheets will buckle. Relief 108 and spring 110 are provided in guide 100, so that the tail of any three-third sheets is held clear of roller pair 102 so that following printed sheets may pass over previous sheets and be accumulated in the nip of assembly 106.

50 If the sheets accumulated in the nip of assembly 106 include a three-thirds sheet gate G2 is deactivated (open) and motor M1 is started and the accumulated sheets are driven into curved, open, one sided buckle chute 112. The assembled sheets are folded by assembly 106 to a two-thirds length and exit assembly 106 for further accumulation with the previously passed form 10. Gate G3 may be activated for a "Z" fold (normally used with a window envelope); as will be described further below.

55 Alternatively a windowed envelope or pre-printed sheets, of three-thirds length, may be fed from trays T3 or T4 by feeder assemblies 114 or 118 and, with gate G4 deactivated, driven along curved guides 120 by roller pairs 122, 124, and 126 and then urged by urge roller 128 for processing by accumulator folder assembly 106 in the same manner as described above for printed envelope forms 10 and printed sheets. Relief 121 and spring 123 are provided to assure that following sheets pass over previous sheets for accumulation.

123 are provided to assure that following sheets pass over previous sheets for accumulation.
 If the sheets accumulated in the nip of assembly 106 are all two-thirds length the assembled sheets exit

assembly 106 along guides 130 without folding.

The previously processed form 10, followed by the assembled sheets, is moved along guides 130 by roller pair 132 and urge roller 134 until it is driven into the nip of accumulator folder assembly 140. Motor M2, which drives assembly 140 is off and the leading edge of the accumulated sheets is aligned with the edge of lower panel 20 of form 10 in the nip of assembly 140. In the same manner as previously described, guides 130 are curved to increase the stiffness of form 10 and the accumulated sheets. Relief 142 operates as described above so that the accumulated sheets will clear form 10 and progress to the nip of assembly 140.

Since laser printer 5 will normally have a feed path whose width is limited to conventional paper size (e.g. approximately 8 1/2") envelope form 10, when feed through printer 5, is fed with flaps 16 folded into the closed position. Accordingly, an opening mechanism 148 is provided along path 130 to open flaps 16 before form 10 is accumulated with the following sheets.

In a preferred embodiment of the subject invention form 10, with flaps 16 folded inwards, is compressed to substantially reduce its thickness so that a larger number may be stacked in a feed tray.

Because form 10, with flaps 16 opened, is substantially wider than the sheets lateral guides, G5 are provided to assure that the sheets are centered with form 10.

If two-thirds sheets, one-third sheets, or BRE's are fed from trays T3 or T4 along guides 120 gate G4 is activated and these sheets are diverted to guides 144. The diverted sheets are urged by urge rollers 153 and 155 into the nip of assembly 140 and are accumulated in the manner described above in the nip of assembly 140 with the previously processed envelope form 10, any printed sheets, and any pre-printed three-thirds sheets. Guides 144 include relief 152 for one-thirds pre-printed sheets and BRE's and relief 154 for two-thirds pre-printed sheets.

After all sheets are accumulated with form 10, motor M2 (not shown), which drives accumulator folder assembly 140, is started and drives the completed accumulation into buckle chute 160 so that the completed accumulation is folded about crease 24 between upper panel 12 and lower panel 20 of form 10. As the folded accumulation exits from assembly 140 it is captured by roller pair 178 and carried into flap folder sealer assembly 180. There adhesive A is moistened by moistener 182, side flaps 16 are closed by closing mechanism 184 and tailing flap 14 is closed, and all flaps are sealed by roller assembly 186. At this point form 10 and the accumulated sheets have been formed into a sealed mail piece. The sealed mail piece than is transported by transport 192 and exits folder sealer 6.

Opening mechanism 148 and closing mechanism 184 comprise pairs of members having compound shapes, respectively designed and positioned to engage side flaps 16 and to rotate flaps 16 open or closed. Lateral guides G5 are automatically, symmetrically adjustable about the center line of guides 130 and 144. To center the sheets, guides G5 are cycled from an outermost position inwards to the nominal width of the sheets, then back to their original position. During this centering operation rollers 134, 146 and 148 are released to allow the sheets to move freely.

Those skilled in the art will recognize that numerous other embodiments of the invention may be developed from the above detailed descriptions and the attached drawings. Accordingly, it is to be understood that the above detailed description and attached drawings are provided by way of illustration only, and that the invention invention is not limited to the described and illustrated details of the particular embodiment.

This application is one of a group of patent applications in our name, all filed in U.S.A. the same date. These applications share common elements of disclosure.

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<u>E.P. Appln. No.</u>	<u>Title</u>	<u>Ref.</u>
5	Envelope Form for Preparing a Multi-Sheet Mail Piece	(C-624)
10	System and Method for Controlling an Apparatus to Produce Mail Pieces in Non- Standard Configurations.	(C-625)
15	System and Method for Controlling an Apparatus to Produce Mail Pieces in Selected Configurations	(C-626)
20	System and Method for Producing Items in Selected Configurations	(C-631)
25	Mechanism and Method for Accumulating and Folding Sheets	(C-632)
30	Mechanism and Method for Folding and Sealing the Upper and Side Flaps of an Envelope Form.	(C-634)
35	Mechanism and Method for Laterally Aligning an Accumulation of Sheets	(C-635)
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45		

50 **Claims**

1. An envelope form for forming an envelope enclosing a sheet having a length equal to one-third, two-thirds or three-thirds of a predetermined length and having a predetermined width, said form comprising:
- 55 a) a substantially lower rectangular panel for forming the back panel of said envelope, said lower panel having a length approximately one-third of said predetermined length and a width slightly less than or equal to said standard width;
- b) a substantially rectangular upper panel for forming the address panel of said envelope connected to said lower panel along a first transverse fold line, and having a length substantially greater than said

- length of said lower panel and a width slightly greater than said predetermined width;
- c) a pair of side flaps for closing the edges of said envelope connected to said upper panel along first and second longitudinal fold lines; and
- d) an upper flap for closing the mouth of said envelope connected to said upper panel along a second transverse fold line; wherein
- e) said width of said lower panel is selected to allow automatic centering of said sheets with respect to said form before said envelope is formed, and said width of said upper panel is selected so that said longitudinal fold lines lie outwards of said sheets after centering, whereby said side flaps may be folded about said longitudinal fold lines to close said edges of said envelope.
- 10 2. A form as described in claim 1 wherein adhesive is applied to said upper and said side flaps for sealing said envelope when said flaps are folded about said fold lines.
- 15 3. A form as described in claim 2 wherein said adhesive is applied said flaps only in regions which are in contact with said back panel when said envelope is formed, whereby said envelope is sealed without adhesion of said side flaps to said sheets.
4. A form as described in claim 3 wherein said side flaps are substantially equal in length to said upper panel.
- 20 5. A form as described in claim 2 wherein said adhesive is applied to said upper flap in the form of spaced spots or stripes, whereby segmented rollers, positioned to contact said form between said spots or stripes, can be used to transport said form without contamination of said rollers.
- 25 6. A form as described in claim 5 wherein said upper flap is substantially equal in width to said upper panel, is substantially rectangular, and has a length selected so that said upper flap is in contact with said lower panel and said side flaps to substantially fully enclose said sheet when said envelope is formed.
- 30 7. A form as described in claim 1 wherein said upper flap is substantially equal in width to said upper panel, is substantially rectangular, and has a length selected so that said upper flap is in contact with said lower panel and said side flaps to substantially fully enclosed said sheet when said envelope is formed.
8. A form as described in claim 1 further comprising a pair of filets at the upper corners of said lower panel for enclosing the lower corners of said envelope.
- 35 9. A form as described in claim 1 wherein said side flaps are folded inwards and said form, with said side flaps folded inwards, is compressed to substantially reduce its thickness.
10. A form as described in claim 1 wherein the difference between the lengths of said upper and lower panels is no greater than approximately 0.75 inches (about 19 mm).
- 40 11. A form as described in claim 1 wherein said predetermined length and width are selected to equal a standard length and width for commercially available stationery sheets.
- 45 12. A form as described in claim 1 wherein said upper panel includes a window so that an address printed on said sheet is visible when said envelope is formed.

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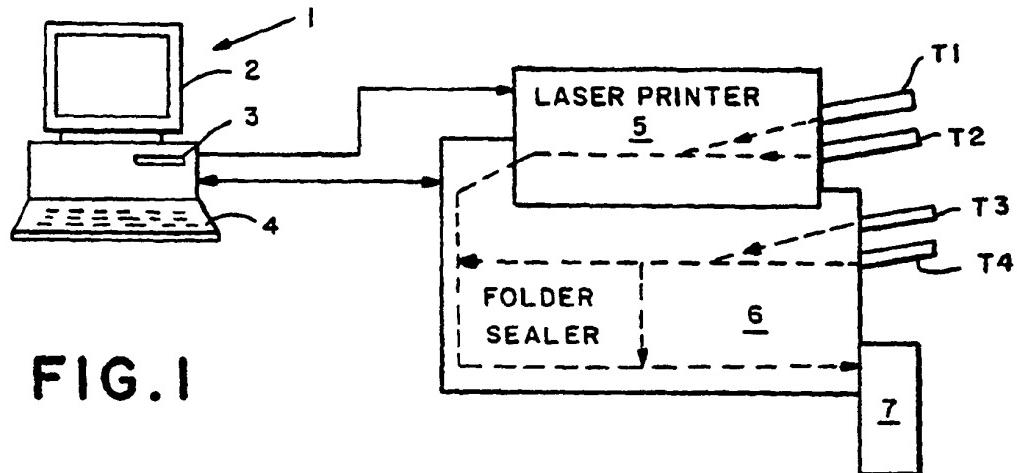


FIG. I

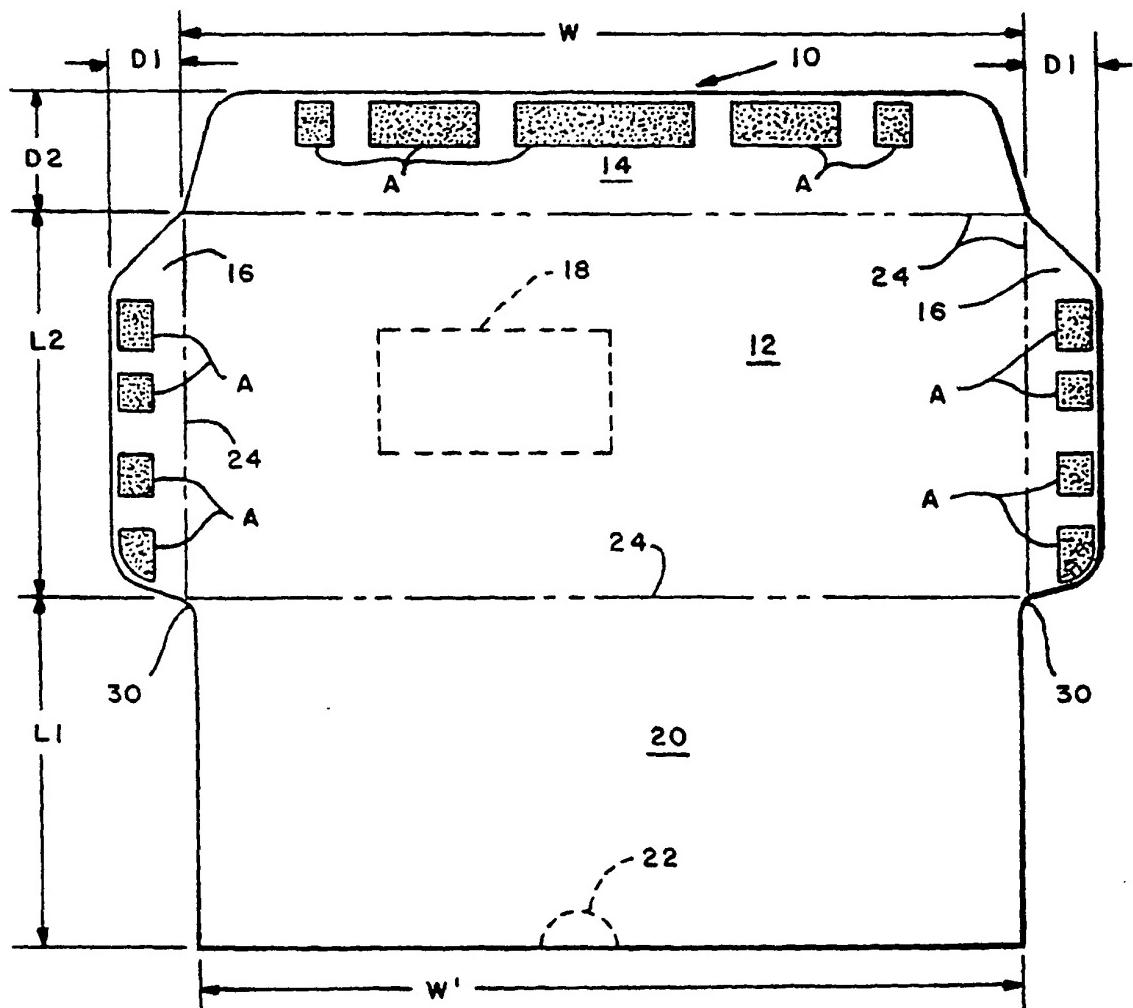
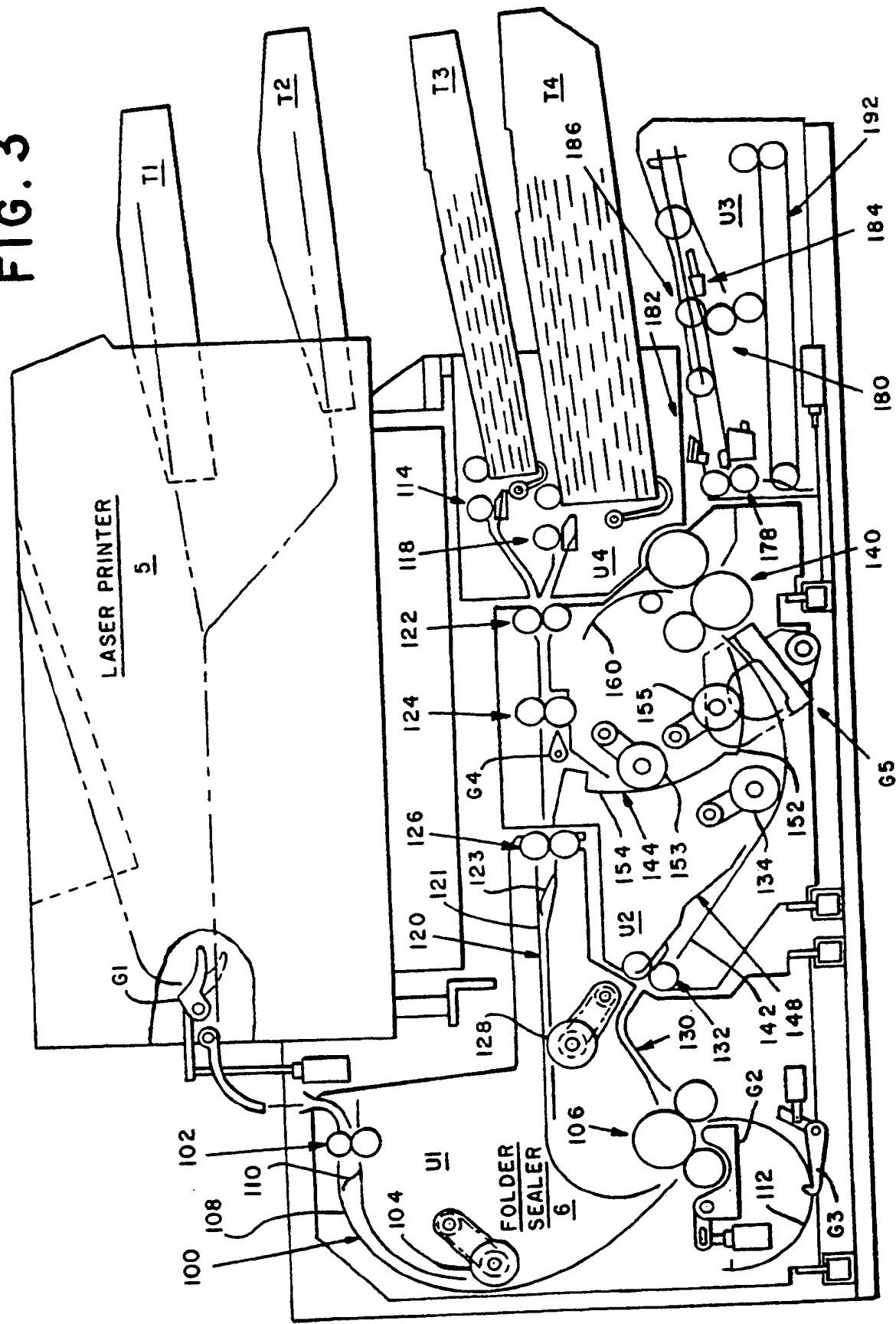


FIG. 2

FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 2055

DOCUMENTS CONSIDERED TO BE RELEVANT									
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)						
X	US-A-4 579 277 (GENDRON)	1-4, 7, 8, 11, 12	B65D27/00 B65D27/14						
A	* column 3, line 65 - column 4, line 11; figure 9 *	6							

TECHNICAL FIELDS SEARCHED (Int. Cl.5)									
B65D									
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>08 JULY 1991</td> <td>LEONG C.Y.</td> </tr> </table>				Place of search	Date of completion of the search	Examiner	THE HAGUE	08 JULY 1991	LEONG C.Y.
Place of search	Date of completion of the search	Examiner							
THE HAGUE	08 JULY 1991	LEONG C.Y.							
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document							